PROJECT facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Clean Coal Power Initiative (CCPI)

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WESTERN GREENBRIER CO-PRODUCTION DEMONSTRATION PROJECT

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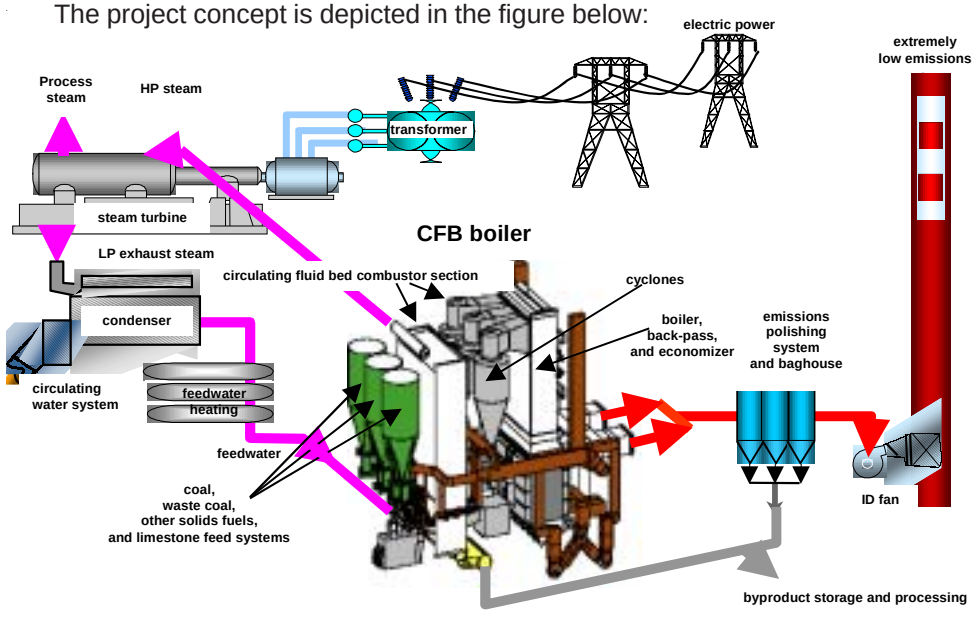
Project Description

Western Greenbrier Co-Generation, LLC, (WGC) is a newly formed public service entity serving three municipalities (Rainelle, Rupert, and Quinwood) in Greenbrier County, West Virginia. WGC proposes to demonstrate a 75 MW clean coal, co-production demonstration project in Rainelle, West Virginia. The power plant will use waste coal contained in a 4 million ton refuse site located in Anjean, West Virginia as its primary fuel while addressing environmental issues associated with coal refuse sites. The project will bring together a highly qualified team including Parsons E&C (Reading, Pennsylvania), Hazen Research Inc. (Golden, Colorado), and Alstom Power Inc. (Windsor, Connecticut). Parsons E&C will serve as the turn-key systems contractor for the municipalities and will work with Alstom Power Inc. to provide an innovative circulating fluidized-bed (CFB) boiler system incorporating an advanced multi-pollutant control system for SOx, NOx, particulate, and mercury. An integrated co-production facility will use ash from the boiler and green wood-waste in a process developed by Midway Environmental Associates (Arvada, Colorado) and Hazen Research to produce structural bricks. This novel power plant will serve as the “anchor tenant” in a new environmentally balanced industrial park. This “Eco-Park” will use hot water from the power plant to provide district heating and steam from the power plant’s turbine exhaust for industrial uses including drying hardwood in a steam kiln. The project concept is depicted in the figure below:



Western Greenbrier Co-Production Demonstration Project

Benefits

A primary benefit of this project is the application of clean coal technologies to improve industrial ecology by employing advanced multi-pollutant control systems, addressing environmental remediation of coal wastes, and using coal, coal wastes and by-products to produce power, process heat and other industrial products. This project offers a unique integration of technologies to convert 1,610 tons/day of coal waste materials that resulted from past mining operations, commonly referred to as “gob”, and 220 tons/day of freshly mined coal, into 75 MW of electricity, 20,000 pounds/hour of steam for industrial use and district heating, 300 tons/day of structural bricks and 970 tons/day of alkaline ash material suitable for use in remediating acid mine drainage. If successful, this technology and integrated approach could be applied to many regions of the country to reclaim contaminated land where waste coal is currently stockpiled and to significantly reduce waste disposal activities from operating coal mines. For example, the State of West Virginia alone contains about 400 million tons of waste coal. The advanced compact CFB power plant incorporates SOx, NOx, particulate, and mercury emissions controls and reduces the standard “footprint” of such plants by 40%. The compact nature of the new system will also reduce structural steel and related construction costs for the boiler system by up to 60%. In addition, the simplified construction process planned for the boiler is expected to result in safer construction practices and a shortened construction time. Employing a Rankine steam cycle for energy conversion (thermal to electricity), this boiler’s targeted reheat steam cycle configuration (1800 psig/1000 ^{O}F/1000 ^{O}F) is deemed aggressive for a power plant of this size, particularly one that uses waste feedstocks. This plant attempts to maximize power generation efficiency, reduce CO2 emissions, conserve water resources, while co-producing steam for commercial and industrial uses.

Aside from the novel power plant design, the project will convert coal waste and other refuse into valuable products including, the production of 75 MW of electricity, alkaline ash for environmental remediation, steam for industrial uses (hardwood drying) and district heating, and co-production of structural bricks. This demonstration will also result in high-quality long-term employment at the power plant and the related “Eco-Park.” Successful integration of these technologies and the development of this facility can serve as a model for other state and local governments interested in remediating similar refuse sites in the U.S. and abroad.